

Examples of developing the
hooks biology

Working scientifically questions:

Planning an enquiry

UKS2 What does each piece of sweets represent?

KS3 What could you use to represent the different parts of the blood?

KS4 Why does the jelly need to be cut to represent red blood cells?

Developing the Hook!

Blood

Vocabulary:

UKS2	KS3
I can select the most appropriate equipment	I can adapt experimental methods and choose the most appropriate equipment to improve the precision and accuracy of my results.

Science behind it.....

Rather than being an experiment this acts as a model to describe the relative distribution of plasma, red blood cells and white blood cells. This can be used as a discussion point. The red blood cell uses cut up jelly to represent the large surface area of red blood cells. This allows for more effective uptake of oxygen. Honey is used to represent the resultant viscosity of plasma due to the materials dissolved in it.

National Curriculum links:

Upper Key Stage 2	Key Stage 3
Animals, including humans- describe the functions of the heart, blood vessels and blood (Year 6)	Specialised cells Biology

Method:

You will need:

- ☐ Chopped up jelly
- ☐ Chopped up strawberry boot laces
- ☐ Clear runny honey
- ☐ Marshmallows chopped up
- ☐ Candy sprinkles
- ☐ Utensils to pick up sweets
- ☐ Scissors or knives to cut up sweets

1. Explain the four components of blood:

- Red blood cells (jelly and boot laces): 44% of blood volume, carry oxygen and carbon dioxide around body. RBC's only live for about 3 months, but are continuously produced in the bone marrow.
- Plasma (honey): 55% blood volume, thick, clear, yellowish liquid that carries dissolved food and wastes.
- White blood cells (marshmallows): 0.5%, bigger than red blood cells, oddly shaped cells that "eat" bits of old blood cells and attack germs – are part of the immune system
- Platelets: (sprinkles) 0.5% - bits of cells that help clot your blood.

Emphasise the relative amounts of the blood components.

2. Mix the sweet "blood" in a large, clear container.

3. Dispense into small cups and pass out one cup to each student. Supply spoons so that the students can eat the sweets if they desire.

Working scientifically skills/questions:

Making predictions (KS2 only)

LKS2 What will happen when your partner says to drop the coin?

UKS2 Is this a reliable method? How could it be improved?

Developing the hook!

Vocabulary:

LKS2	UKS2
I can plan different types of enquiries	I can plan different types of scientific enquiries to answer questions.
I can suggest improvements and raise further questions	I can use results to make predictions and set up more tests (including fair tests)

Method:

You will need:

- Five 1p pieces
- Small paper cup
- A table
- Two people

Catch a penny

1. Put a cup in front of your partner. It should be about 2 feet away from him or her.
 2. Ask your partner to close one eye.
 3. Hold one of the pennies in the air about 18 inches above the table.
 4. Move it around slowly.
 5. Tell your partner that you'll drop the penny whenever he or she says 'Drop it!'
- The idea is for your partner – with one eye closed – to judge when the penny is over the cup so that the penny will drop into the cup.
6. Give your partner five tries with one eye closed, then five tries with both eyes open. Which way worked best?
 7. Try with different eyes. Is there any difference?

Science behind it:

Your eyes are at work from the moment you wake up to the moment you close them to go to sleep. They take in tons of information about the world around you — shapes, colours, movements, and more. Then they send the information to your brain for processing so the brain knows what's going on outside of your body. Rods and cones process the light to give you the total picture. You're able to see that your friend has brown skin and is wearing a blue hat while he tosses an orange basketball.

Sometimes someone's eyeball shape makes it difficult for the cornea, lens, and retina to work perfectly as a team. When this happens, some of what the person sees will be out of focus.

To correct this fuzzy vision, many people, including many kids, wear glasses. Glasses help the eyes focus images correctly on the retina and allow someone to see clearly. As adults get older, their eyes lose the ability to focus well and they often need glasses to see things up close or far away. Most older people you know — like your grandparents — probably wear glasses.

National Curriculum links:

Upper Key Stage 2	KS3
Animals, including humans (Year 6)	Skeletal and muscular systems

Working scientifically skills/questions:

Gathering and recording results

UKS2 What will you record?

KS3 How will you record your results?

Developing the Hook!

Method:

You will need:

- Something to block your view
- 2 x paint brushes (same size)
- Stuffed rubber glove
- Blanket or sleeve

Rubber glove senses

1. Ask the child to sit at a table with a screen slightly to their left.
2. They place their left hand on the far side of the screen, so that they cannot see it.
3. In front of them, and in their view, is a rubber glove stuffed with cotton wool. Cover where the rubber glove's 'arm' would be with a blanket and ask them not to move their left hand.
4. Get two paint brushes and strokes the child's hand and the glove in the same places at the same time. This is done for a few minutes and they should begin to feel as though the rubber glove is actually their hand.
5. Then suddenly point and slam onto the rubber glove and they should react by pulling their real hand away from the perceived danger.

Measure the reaction timings using a stopwatch

National Curriculum links:

Upper Key Stage 2	Key Stage 3
Animals, including humans- muscles, joints and nerves (Year 6)	Muscular systems Biology

Vocabulary:

UKS2	KS3
I can decide how to record data and results. I can use scientific diagrams, labels, classification, keys, tables, scatter, bar and line graphs.	I can justify when data is recorded using bar, line or scatter graph.

Science behind it:

Your sense of proprioception combines information from your muscles, nerves, and joints to build an image of where the parts of your body are, so it's easy to touch your own nose with your eyes closed because you know where both your hand and your nose are and can bring them together.

However, your complete picture of the world is a combination of all your senses, so sight and touch also add to what you think your body is doing. In these illusions, you either remove one of the senses or trick what they are experiencing and so sight, touch, and proprioception are getting conflicting information. As humans rely on sight quite heavily, we tend to trust it over other senses, so when your sight and proprioception disagree, you're more likely to believe what your sight is telling you.

Examples of developing the hooks chemistry

Working scientifically skills/questions:

Making predictions (KS2 only)

LKS2 What do you think is going to happen?

UKS2 What do you think is going to happen as I tip the beaker? Why?

Method:

You will need:

- A Jug
- Baking powder
- Vinegar
- Candles
- Matches
- A Sand Tray

1. Light some candles and place them in a sand tray.
2. Put a couple of tablespoons of baking soda into a jug.
2. Pour about 100cm³ of vinegar into the jug with the baking soda.
3. Let the reaction and the foaming calm down.
4. Hold the container next to and above the flame. Slowly tilt the container and pour the gas from the container onto the flame. Don't pour the liquid. The candle flame is no more!

CO₂ candles

National Curriculum links:

Lower Key Stage 2	Upper Key Stage 2
States of matter - compare and group materials together - according to solids, liquids and gases (Year 4)	Properties of materials – use knowledge of solids, liquids and gases (Year 5)

Vocabulary:

LKS2	UKS2
I can plan different types of enquiries	I can plan different types of scientific enquiries to answer questions.
I can suggest improvements and raise further questions	I can use results to make predictions and set up more tests (including fair tests)

Science behind it...

A fire requires oxygen (O₂), fuel, and heat to burn. These three components are called the fire triangle or the combustion triangle. Remove any one of the three components, and the fire goes out.

Baking soda (sodium bicarbonate) is a base and vinegar (acetic acid) is a weak acid. When they combine, the immediate reaction creates carbonic acid. However, carbonic acid is very unstable, and it quickly decomposes into carbon dioxide (CO₂) and water (H₂O). The bubbles you saw in the jug were full of CO₂. There was so much of it, in fact, that it pushed all other gases out of the container and filled it completely. Since CO₂ is denser than air, the container was filled with it and nothing else. As you tilt the container, you pour the CO₂ onto the flame. That means air can't get to the flame and it goes out because of the lack of oxygen.

Developing the Hook! Diffusing skittles

Vocabulary

Working scientifically skills/questions: Interpreting results

LKS2 Can you see a pattern in your results.

UKS2 How does the temperature of the water affect the time the sweet takes to dissolve?

Science behind it.....

The coloured dye in the skittles is soluble in water. The water molecules have kinetic energy.

This causes the dye to move. The hot water has more kinetic energy and therefore the dye travels faster across the plate.

National Curriculum links:

Lower Key Stage 2	Upper Key Stage 2
States of Matter (Year 4)	Properties and changes of materials – dissolving (Year 5)

LKS2	UKS2
I can spot patterns and refer to these when answering the questions, I set at the start of the experiment.	I can use data from primary and secondary sources to explain causal relationships

Method:

You will need:

- 4 x large plastic plates
- 1 x packet of skittles
- Water at different temperatures
- Stopwatch
- Thermometer.

1. Place different coloured skittles around the edge of the plate.
2. Add 100ml of cold water in the centre of the plate
3. Time how long it takes for the dye to diffuse - to travel to the centre of the plate.

Repeat the experiment using different temperatures of water.

Working scientifically skills/questions:

Identifying and classifying

UKS2 What variable will you change and which will you keep the same?

KS3 What features of my water rocket will you keep the same and why?

Developing the Hook!

Vocabulary:

UKS2	KS3
I can choose which variable to stay the same and which to change in an experiment.	I can define the terms independent, dependent and control variables.
I can classify data in a key.	I can place variables in my experiments in each of these groups.

Fizzy bottle rockets (can also be done with film cannisters)

Method:

You will need:

- Small (500ml or less) drinks bottle with a sports cap lid which pops open
- Fizzy headache or vitamin tablets
- Mug or glass or jar that allows upside-down bottle to fit inside, with lid touching bottom.
- Warm water from the hot tap.

1. Unscrew the lid of your bottle and make sure pop up lid is firmly pressed down.
2. Half-fill the bottle with warm water.
3. Break two fizzy tablets in half and drop them into the bottle.
4. Quickly screw lid back on firmly, give bottle a quick shake and place upside down in mug or glass or jar (left).
5. Stand back and wait.

National Curriculum links:

Upper Key Stage 2	Key Stage 3
Properties and changes of materials - explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible (Year 5)	Energy transfers Particle theory Chemical reactions Physics Chemistry

Science behind it:

In the bottle the water and the alka seltzer react in a chemical reaction. This means new products are formed. In this reaction carbon dioxide is produced. In this reaction an energy transfer occurs giving the gas particles kinetic energy. This causes the molecules of carbon dioxide to hit the walls of the water bottle. This causes the pressure inside the bottle to increase until a jet is forced out of the bottle propelling the water bottle into the air.

Developing the Hook!

Working scientifically skills/questions:

Planning an enquiry

LKS2 What might happen if we changed the temperature of the liquid?

KS3 What would do you think might happen if we put the raisins into the lemonade bottle and screwed on the cap?

Method:

You will need:

- A Beaker
- Handful of raisins (10-15)
- Lemonade
- Glass of water

1. Fill the glass with water
2. Drop 10-15 raisins into the water
3. Focus all of your attention on those raisins. Are they moving?
4. Pour lemonade into the beaker and add 10-15 raisins. Are they moving? Yes! They're floating, they're bobbing up and down, and they're dancing!

National Curriculum links:

Lower Key Stage 2	Key Stage 3
States of Matter - compare and group materials together according to whether they are solids, liquids or gases (Year 4)	Properties of different states of matter - gas pressure Biology/Chemistry

Vocabulary:

LKS2	UKS2	KS3
I can plan different types of enquiries I can suggest improvements and raise further questions	I can plan different types of scientific enquiries to answer questions. I can use results to make predictions and set up more tests (including fair tests)	I can develop a line of enquiry on observations of the real world alongside prior knowledge. I can identify which sources of data/information will be most valid/reliable

Romping Raisins

Science behind it:

The raisins will bob up and down for several minutes. This “raisin dance” is captivating to watch. Since the surface of the raisins is rough, tiny bubbles of carbon dioxide gas are attracted to it. These bubbles increase the volume of the raisin substantially, but contribute very little to its mass. As a result, the overall density of the raisin is lowered, causing it to be carried upward by the more dense fluid surrounding it.

Archimedes' Principle states that the buoyant force exerted on a fluid is equal to the weight of fluid displaced. Since the raisins now have a greater volume, they displace more water, causing the fluid to exert a greater buoyant force. The buoyant force of the surrounding fluid is what pushes the raisins to the top.

Once the raisins reach the top, the bubbles pop upon exposure to the air. This makes the raisins more dense, causing them to sink. As more bubbles adhere to the raisins, the density of the raisins decreases and they rise to the surface again. This experiment very clearly shows that an increase in volume (as long as the mass increase is negligible) will lead to a decrease in density. The bubbles that attach themselves to the raisins are like little life jackets that make the raisins more buoyant by increasing their volume.

Working scientifically skills/questions:

Planning and setting up different types of enquiries – Prediction

LKS2 What will happen to the pen marks when alcohol is added?

KS3 What would happen if water was added instead of rubbing alcohol?

Method:

You will need:

- A large mouth plastic cup
- Rubber band
- 91% isopropyl alcohol (rubbing alcohol)
- Sharpie® pens, various colours
- Piece of white cotton fabric
- Dropper squeeze bottle

Sharpie Chromatography

1. Place the plastic cup inside the middle of the fabric.
2. Position the opening of the cup directly under the section of fabric that you want to decorate.
3. Stretch the rubber band over the fabric and the cup to secure the fabric in place.
4. Place dots of different coloured ink in a circular pattern about the size of a 50p piece in the centre of the stretched out fabric.
5. Slowly squeeze approximately 20 drops of rubbing alcohol into the centre of the circle of dots.
6. Allow the developed design to dry for three to five minutes before moving on to a new area of the fabric.

National Curriculum links:

Lower Key Stage 2	Key Stage 3
States of Matter (Year 4)	Solutions chromatography
	Chemistry

LKS2	UKS2	KS3
I can plan different types of enquiries	I can plan different types of scientific enquiries to answer questions.	I can develop a line of enquiry on observations of the real world alongside prior knowledge.
I can suggest improvements and raise further questions	I can use results to make predictions and set up more tests (including fair tests)	I can identify which sources of data/information will be most valid/reliable

Science behind it.....

This is really a lesson in the concepts of solubility, colour mixing, and the movement of molecules. The Sharpie markers contain permanent ink, which will not wash away with water. Permanent ink is hydrophobic, meaning it is not soluble in water. However, the molecules of ink are soluble in another solvent called rubbing alcohol. This solvent carries the different colours of ink with it as it spreads in a circular pattern from the centre of the shirt.

Please refer to CLEAPSS if wanting to use rubbing alcohol.

Developing the hook
examples for physics

Working scientifically skills/questions: Developing the hook Cosmic Ball

Using equipment

LKS2 How will I get the cosmic ball to light/buzz?

UKS2 What happened when you added more people to the circuit?

Vocabulary:

LKS2	UKS2
I can use different equipment to measure accurately	I can select the most appropriate equipment

Method:

You will need:

- cosmic ball
- Student volunteers

Show the students that if you touch both sides of the cosmic ball on the metal plates it will create a complete circuit and the ball will light and buzz.

Repeat with one student. Place one hand on one of the metal plates, Hold their hand with your other hand. Firstly get them to leave their second free. The ball will not light.

Ask the student to place their free hand on the free metal plate with your hand on the second plate. The ball will light and buzz as a complete circuit is made,

Repeat with a whole class of students.

National Curriculum links:

Lower Key Stage 2	Upper Key Stage 2
Electricity construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers (Year 4)	Electricity pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors (Year 6)

Science behind it.....

Inside the ball is a circuit. By touching the metal plates this moves a switch to complete the circuit. The ball lights as the electrons are able to travel through the circuit.

Working scientifically skills/questions:

Performing tests

UKS2 Can you set up the equipment as shown in the image?

KS3 How can you ensure that the experiment is successful? What Health and Safety considerations are there?

Method:

You will need:

- Large eggs
- Cardboard tube from an empty roll of toilet paper
- Plastic plate
- Pitcher of water
- Large drinking glass

- 1.Fill the drinking glass about three-quarters full with water and centre the plate on top of the glass.
- 2.Place the cardboard tube vertically on the plate, positioning it directly over the water.
- 3.Carefully set the egg on top of the cardboard tube.
- 4.Explain to your audience that the goal is to get the egg into the glass of water, but you’re not allowed to touch the egg, the cardboard tube or the glass of water.
5. The only thing left for you to touch is the plate. Your going to smack the plate out of the way. Don’t do it just yet . . . read the next step.
6. Stand directly behind the Egg Drop setup. If you’re right handed, hold your right hand straight out like you were going to karate chop something.
- 7.Position your hand about 6 inches away from the edge of the plate. Then hit the plate of water.

Developing the Hook! Egg inertia

Vocabulary:

UKS2	KS3
I can set up fair tests when necessary.	I can apply appropriate techniques paying particular attention to Health and Safety.

Science behind it.....

Credit for this one has to go to Sir Isaac Newton and his **First Law of Motion**. Newton said that objects in motion want to keep moving and objects that are stationary want to stay still—unless an outside force acts on them. So, since the egg is not moving while it sits on top of the tube, that’s what it wants to do—not move. You applied enough force to the plate to cause it to zip out from under the cardboard tube. The edge of the plate hooked the bottom of the tube, which then sailed off with the plate. Basically, you knocked the support out from under the egg. For a brief nanosecond or so, the egg didn’t move because it was already stationary (not moving). But then, as usual, the force of gravity took over and pulled the egg straight down toward the centre of the Earth. Also, according to Mr. Newton’s First Law, once the egg began moving, it didn’t want to stop. The container of water interrupted the egg’s fall, providing a safe place for the egg to stop moving so you could recover it unbroken. The force of gravity on the egg caused the water to splash out.

National Curriculum links:

Upper Key Stage 2	Key Stage 3
Forces- explain that unsupported objects fall towards the Earth because of the force of gravity (Year 5)	Link between gravity and weight Physics

Developing the Hook!

Working scientifically skills/questions:

Making predictions – KS2 only

LKS2 What do you think is going to happen?

UKS2 What will happen to the cornflour when water is added?

Method:

You will need:

- Large mixing bowl / tray
- Measuring jug
- Cornflour (50g / 16 oz)
- Water (30ml / 16 fl oz)
- Spoon

1. Place 4 cups of cornflour into a large mixing bowl.

2. Add water

3. Use your hands to mix it into the cornflour.

Repeat the process in a separate tub this time adding butter. Compare the consistency of the two mixtures you have made.

Science behind it:

When you mix cornflour with water, the large cornflour particles remain 'suspended' (float around) in the liquid.

Cornflour slime is thick because the particles are packed very close together, yet they are still able to slip past each other.

When you stir the mixture slowly it acts like a liquid because the suspended particles have time to move past each other.

Yet when you put sudden stress on the mixture, by rolling it for example, the water quickly flows out of the area but the particles do not have enough time to move out of the way.

The cornflour particles temporarily stay packed up where they are, which makes the slime act like a solid.

Oobleck

Vocabulary:

LKS2	UKS2	KS3
I can plan different types of enquiries	I can plan different types of scientific enquiries to answer questions.	I can develop a line of enquiry on observations of the real world alongside prior knowledge.
I can suggest improvements and raise further questions	I can use results to make predictions and set up more tests (including fair tests)	I can identify which sources of data/information will be most valid/reliable

National Curriculum links:

Lower Key Stage 2	Key Stage 3
States of Matter – compare and group materials together, according to whether they are solids, liquids or gases (Year 4)	Differences in arrangements of motion and closeness of particles explaining changing in state, shape and density
	Physics